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March 29, 1995

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**FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY**

EX PARTE

William F. Caton
Acting Secretary
Federal Communications Commission
Mail Stop 1170
1919 M Street, N.W., Room 222
Washington, D.C. 20554

DOCKET FILE COPY ORIGINAL

Dear Mr. Caton:

Re: CC Docket No. 94-54 - Equal Access and Interconnection Obligations Pertaining to
Commercial Mobile Radio Service

Please associate the attached study regarding "GSM Technology and Hearing Aids" with
the above-referenced proceeding.

We are submitting two copies of this notice in accordance with Section 1.1206(a)(1) of
the Commission's Rules.

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William F. Caton
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Please stamp and return the provided copy to confirm your receipt. Please contact me should you have any questions or require additional information concerning this matter.

Sincerely,

A handwritten signature in black ink, appearing to be 'W. Caton', with a long horizontal stroke extending to the right.

Attachment

cc: Rosalind K. Allen
Laurence D. Atlas
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GSM TECHNOLOGY AND HEARING AIDS

Concerns have recently been raised regarding potential interference to hearing aids from a digital telecommunications technology based on the European GSM standard. Several providers of personal communications services (PCS) are planning to implement modified GSM technology in the United States. The competition among various potential providers of PCS equipment is fierce. It appears as though some of that competition may have stimulated the recent flap over GSM and hearing aids.

U.S. and European experts agree this is not a public health or safety issue, but rather an issue of interference management. In the United States and Canada, the joint health/safety committee of wireless carriers and manufacturers has advocated that interference management issues can best be addressed by cooperative inter-industry efforts to achieve electromagnetic compatibility (EMC). The North American wireless community is committed to support of industry and independent programs to address electromagnetic compatibility and interference management. In Europe, wireless carriers and manufacturers are engaged in inter-industry efforts to achieve EMC and the European Telecommunications Standards Institute (ETSI) is proposing additional shielding standards where appropriate.

The proliferation of new digital electronic equipment and radio frequency emitting equipment world wide means the potential for interference to or interaction with hearing aids is also increasing. World wide, the predominant source of reported interference to hearing aids has been from non-radio devices. In America, reported hearing interference is predominantly from non-radio electronic equipment, such as florescent lights and computers. Outside the United States, most digital systems use GSM modulation. The GSM MoU has 118 GSM radio operators in 69 countries serving over five million subscribers. Reported hearing aid interference has been limited, and typically associated with older, poorly shielded units. Interference studies by regulatory authorities, operators and the GSM MoU have demonstrated that cost effective hearing aid shielding ensures user access to digital phones and eliminates interference from other non-radio sources. ETSI studies of potential interference indicated personal audio equipment and hearing aids were most susceptible to interference from GSM. Similarly, early evaluations of digital radio in the U.S. and Canada --including CDMA, TDMA, and GSM equipment -- indicate personal audio equipment and hearing aids are most susceptible to interference.

Efforts by industry and standards bodies are directed at promoting compatibility in the changing electromagnetic environment. Electromagnetic compatibility is the ability of a product or device to operate in its intended electromagnetic environment without receiving interference and without being a source of interference. An unshielded device, for instance, will sometimes malfunction or not perform optimally after picking up signals from other sources. In order to avoid this degradation in service, device



manufacturers provide a certain level of electromagnetic immunity (shielding) in their equipment. In Europe, the generic immunity standard specifies that domestic equipment must be immune to interference from RF electromagnetic fields of 3 volts per meter (3 V/m). In light of the rapid spread of digital equipment in Europe -- including phones that employ digital modulation -- ETSI is considering increasing the level of immunity from 3 V/m to 10 V/m. There are no generic immunity standards in the United States although much equipment meets the 3 V/m level.

The European Experience

Responding to concerns about interference to hearing aids, medical devices and other electronic equipment, European standards organizations have extensively studied the potential for interference. Results of the European testing indicated that personal audio equipment and hearing aids were most susceptible to interference from GSM. The average level at which hearing aids detected interference was about 4 V/m. Levels at which personal audio equipment -- including portable radios, amplifiers, CD players and television receivers -- detected interference ranged from 3 to 14 V/m. Hearing aids were considered to be the biggest potential problem and the European investigation focused on this area. The investigation concluded that although there was no public health or safety problem, there was the potential for GSM to cause interference to some hearing aid users.

This issue was the subject of a presentation to the recent GSM World Congress held in Madrid from February 7-9, 1995. In a paper presented to the Congress, Stuart Sharrock, Editor, *Mobile Communications International*, stated:

“Clearly there is a potential problem. Not a safety problem but a problem that GSM may cause irritating and annoying interference to hearing aid users and domestic audio equipment. Hearing aid users are not unfamiliar with interference problems, interference caused by florescent lights is in fact generally worse than interference from GSM phones.... To put these figures into context, note that field strengths of 5 V/m can be generated by interior electronic wiring, a hair dryer produces around 50 V/m and an electronic razor 100 V/m. Overhead power lines generate field strengths in the region of 100 V/m and electric fields during thunderstorms produces up to 20,000 V/m”

As mentioned previously, the European solution was to propose increased immunity of body-worn devices to 10 V/m. The European Hearing Instruments Manufacturers Association is also investigating how to measure interference in an increasingly dynamic electromagnetic environment and how to design hearing aids that have sufficient immunity levels. Similar work is underway in Australia.



A factsheet issued in October 1994 by the Royal National Institute for Deaf People concludes:

“Hearing aids do not last forever, and it is hoped that new hearing aids will be less affected by interference. Several organizations, including hearing aid manufacturers, are investigating the problem, and hearing aid manufacturers are working towards designing hearing aids that pick up less of the interference. That is why it is important to have a standard way of measuring the immunity of hearing aids. This standard is being developed as quickly as possible so it will be possible to compare hearing aids, and hearing aid purchasers will be able to buy hearing aids with high immunity.”

Activities in the United States

In the U.S., most reported interference to electronic equipment has come from non-radio equipment. Reported radio interference to electronic equipment, including hearing aids, has typically come from private high power mobile radios such as those used by police, fire and emergency medical personnel, or from amateur radio. As digital technologies are incorporated into U.S. electronic and radio equipment, cooperation among manufacturers to provide EMC will be essential. The best path to electromagnetic compatibility is to understand the electromagnetic environment and to increase the immunity of devices to undesired transmissions.

Americans increasingly use cellular and paging devices for productivity and personal safety. Portable commercial radio is dramatically changing: wireless service providers including cellular, PCS, ESMR and paging operators are all offering or developing new digital services. These services will use more than one type of signaling modulation. Some cellular operators already provide digital service using TDMA modulation that is similar to GSM modulation. In the near future, wireless service providers will use CDMA and GSM modulation systems. GSM systems in the United States will differ from the GSM systems in Europe: U.S. systems will operate at higher frequencies and mobiles and portables will use lower power. Interference studies conducted in Europe are relevant for estimating interference in America. However, systems used in America will have less interference potential because of the lower power. Evaluations of interference from TDMA, GSM and CDMA systems designed for the American market have shown that all can interfere with poorly shielded devices, including hearing aids, especially when the transmitter is adjacent to the hearing aid.

Wireless carriers and manufacturers in the United States and Canada have advocated that interference management issues can best be addressed by cooperative inter-industry efforts to achieve electromagnetic compatibility. This view is supported by



the GAO study for Congress, and by testimony of the Health Industry Manufacturers Association and the FCC before Congress.

The wireless community has demonstrated its commitment to this approach through the support of industry and independent programs to address electromagnetic compatibility. It is the responsibility of all industries producing wireless and electronic devices work cooperatively to promote EMC. To this end, the Center for the Study of Wireless Electromagnetic Compatibility was established in 1994 at the University of Oklahoma with seed money from the wireless industry.

This independent Center assures that all businesses and industries have access to electromagnetic evaluation services. The Center has six functions: undertake testing to ensure that electronic devices are properly designed and installed to resist unintended interaction with external electromagnetic sources; host forums to address EMC issues; conduct research to evaluate and resolve EMC issues; educate consumers and users about EMC considerations; coordinate the activities of industries and organizations involved in setting EMC standards; and assist societies and trade organizations to address inter-industry EMC issues.

The wireless industry is currently working cooperatively with the pacemaker industry in funding a study by the Center of interaction between pacemakers and wireless portable devices. The wireless industry has also requested that the Center undertake a hearing aid testing program with the involvement and cooperation of manufacturers of hearing aids for the North American market. It is hoped that such an effort will identify appropriate measures to eliminate interference, and provide information to help determine appropriate overall immunity levels for hearing aids, and user guides for hearing aid users.

Some misinformation has been developed based on interference studies in Europe. Electrical devices, including the different digital modulation radio systems, have the potential to interfere with other poorly shielded devices. In Europe, GSM systems operating at higher powers than those proposed for the United States are operated safely. Some hearing aid users have detected interference from GSM systems, and some hearing aid users in America will detect interference from GSM, TDMA or CDMA systems. The wireless industry is committed to electromagnetic compatibility, and will work cooperatively with hearing aid manufacturers to ensure all Americans can enjoy the benefits of a diverse, competitive wireless industry.